

What is claimed is:

1. A method of detecting a defect on a substrate, the method comprising:
irradiating a light on a substrate, wherein the substrate has a plurality of device units
5 formed on a surface of the substrate and each device unit includes a plurality of pixels;
forming first image data for each pixel on each device unit by sensing the light
reflected from the substrate surface;
forming second image data of a specific defect;
comparing the first image data with the second image data;
10 marking a pixel corresponding to the first image data as a defective pixel when the
first image data corresponds to the second image data.

2. The method of claim 1, wherein the substrate includes a wafer for fabricating a
semiconductor device and the device unit further comprises a unit cell operating as an
15 independent electronic circuit on the wafer.

3. The method of claim 1, wherein the irradiating light includes a short-wave
light.

4. The method of claim 4, wherein the short-wave light includes an ultraviolet
light.

5. The method of claim 1, wherein the image data includes binary digital data.

6. The method of claim 5, wherein the binary digital data represents a level on a
gray scale, wherein the gray scale is distinguishable by a relative density of black and white.

7. The method of claim 6, wherein the gray scale is divided into 256 different
levels.

8. The method of claim 1, wherein forming second image data of a specific
defect comprises observing the substrate surface.

9. The method of claim 8, wherein observing the substrate surface comprises using an optical or electromagnetic instrument.

10. The method of claim 9, wherein the electromagnetic instrument includes a scanning electron microscope (SEM).

11. The method of claim 1, wherein the second image data includes a particular digit and marking a pixel corresponding to the first image data as a defective pixel when the first image data is substantially identical to the second image data.

12. The method of claim 1, wherein the second image data includes a range defined by upper and lower limits and marking a pixel corresponding to the first image data as a defective pixel when the first image data is substantially identical to the second image data.

13. The method of claim 1, further comprising displaying the defective pixel and a defect image on a monitor.

14. The method of claim 1, wherein the plurality of device units have the same pattern.

15. A method of detecting a defect on a substrate comprising:
irradiating a light on a substrate, wherein the substrate has a plurality of device units formed on a surface of the substrate and each device unit includes a plurality of pixels;

forming image data for each of the pixels on each device unit by sensing the light reflected from the surface of the substrate;

forming first differential image data of a target pixel by subtracting the image data of a corresponding pixel from the image data of the target pixel, wherein the target pixel is a subject pixel for detecting a defect and the corresponding pixel is positioned in a first device unit adjacent to a second device unit that includes the target pixel, wherein the corresponding pixel corresponds to the target pixel;

comparing the first differential image data with a preset threshold value;

forming second differential image data of the target pixel when the first differential image data of the target pixel is greater than the threshold value;

comparing a defect size of the second differential image data of the target pixel with a reference size range of a specific defect;

forming a third differential image data of the target pixel when the second differential image data of the target pixel is within the reference size range of the specific defect; and

5 marking the target pixel corresponding to the third differential image data as a defective pixel.

16. The method of claim 15, wherein the substrate includes a wafer for fabricating a semiconductor device and the device unit further comprises a unit cell operating as an
10 independent electronic circuit on the wafer.

17. The method of claim 15, wherein the irradiating light includes a short-wave light.

18. The method of claim 17, wherein the short-wave light includes an ultraviolet light.

19. The method of claim 15, wherein the image data includes binary digital data.

20. The method of claim 19, wherein the binary digital data represents a level on a gray scale, wherein the gray scale is distinguishable by a relative density of black and white.

21. The method of claim 15, further comprising displaying the defective pixel and a defect image on a monitor.

22. The method of claim 15, wherein the plurality of devices units have the same pattern.

23. An apparatus for detecting a defect on a substrate, the apparatus comprising:
30 a support for supporting a substrate, wherein the substrate has a plurality of device units with a same pattern formed on a surface of the substrate and each device unit includes a plurality of pixels;
a light source for irradiating a light on the substrate;

an image detector for sensing light reflected by a surface of the substrate from the light source, wherein the image detector generates analog image data for each pixel of each device unit;

an analog-to-digital converter for converting the analog image data to digital image data;

a reference setting unit for setting a threshold value and a reference size range;

a data processing unit for forming first differential image data of a target pixel by subtracting the digital image data of a corresponding pixel from the digital image data of the target pixel, the target pixel being a subject pixel for detecting a defect, and the

corresponding pixel being a neighboring pixel that is positioned in a first device unit adjacent to a second device unit including the target pixel and that corresponds to the target pixel;

a reference setting unit for setting a threshold value and a reference size range, the threshold value being compared with the first differential image data and the reference size range being compared with a defect size corresponding to a specific defect; and

a checking unit for checking a defective pixel, whereby the first differential image data becomes second differential image data of the target pixel if the first differential image data is greater than the threshold value, and the second differential image data of the target pixel becomes third differential image data of the target pixel, if the second differential image data of the target pixel is within the reference size range, the checking unit checking the target pixel corresponding to the third differential image data as the defective pixel.

24. The apparatus of claim 23, wherein the substrate is a wafer for fabricating a semiconductor device and the plurality of device units are unit cells operating as independent electronic circuits on the wafer.

25. The apparatus of claim 23, wherein the light of the light source includes a short-wave light.

26. The apparatus of claim 23, wherein the short-wave light includes an ultraviolet light.

27. The apparatus of claim 23, wherein the digital image data is expressed as a gray scale distinguishable by a relative density of black and white.

28. The apparatus of claim 23, further comprising a monitor for displaying the defective pixel and a defect image.

29. An apparatus for detecting a defect on a substrate, the apparatus comprising:
5 a support for supporting a substrate, wherein the substrate has a plurality of device units with a same pattern formed on a surface of the substrate and each device unit includes a plurality of pixels;

a light source for irradiating a light on the substrate;

10 an image detector for sensing light reflected by a surface of the substrate from the light source;

a reference setting unit for setting a threshold value, wherein the threshold value is digital image data of a specific defect; and

a marking unit for marking a pixel as defective when the digital image data of the pixel is substantially identical to the threshold value.

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30. The apparatus of claim 29, wherein the digital image data is expressed as a gray scale distinguishable by a relative density of black and white.

31. The apparatus of claim 29, further comprising a monitor for displaying the defective pixel and a defect image.

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32. The apparatus of claim 29, wherein the image detector generates analog image data for each pixel of each device unit, further comprising an analog-to-digital converter for converting the analog image data to digital image data.

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